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·研究简报·

## 5kW 水下集鱼灯镇流器的研制

### The development of stabilizer for 5kW underwater fish attraction light

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随着我国鱿钓渔业的兴起与发展,近年来,水下集鱼灯的应用正在我国鱿钓渔业中逐渐推广和流行。应用水下集鱼灯的最大好处,就是使原先只在夜间有价值进行的鱿钓作业,变成在白昼也可有价值地进行。这样,充分利用了有限的渔汛期,提高了产量,降低了远航渔船的生产成本,其经济效益是显而易见的。

目前,鱿钓作业中用作水下集鱼灯的光源主要有二种:一种是白炽灯中的佼佼者——卤钨灯;另一种则是气体放电灯中的新军——金属卤化物灯。卤钨灯发光效率较低,主要是在需要调光的场合作为辅助光源使用。卤钨灯并不需要镇流器配套。金属卤化物灯发光效率高,而且还可以通过添加适当的金属卤化物材料,使其发出在水中具有最佳穿透率的绿光,它是水下集鱼灯的主光源。但金属卤化物灯的光强只能在较小范围内调节,因为当灯管电流小到一定值时,它便会突然熄灭。因此,在需要调节光强的场合,除了使用金属卤化物灯外,还需卤钨灯的参与。由于金属卤化物灯具有负阻特性( $\frac{dV}{dI} < 0$ ),所以工作时必须与镇流器配套使用<sup>[1]</sup>。

## 1 镇流器主体的研制

### 1.1 方案的确定

用于金属卤化物灯的镇流电路有很多型式。国内流行的线路(源自美国)与日本流行的线路不一样。但国内尚无如此大功率的镇流器产品,而国内正在使用的鱿钓水下集鱼灯系统均为日本产品。是根据国内流行的线路自行设计,还是仿造日本产品?通过斟酌,科研人员选择了前者。这是因为:

(1) 从电气性能上看两者相当,但国内流行的线路更简洁因而更可靠。

(2) 在整机重量上,日本线路要优于国内线路。但按日本线路试制,则需要寻找和物色有加工能力的协作伙伴,试制周期和试制成本都可能不尽人意;而按国内线路研制,则有现成的合作多年的外协伙伴,试制周期和试制成本很容易预计和得到控制。

(3) 有关科研人员对国内线路不熟悉,曾按此线路成功开发过 AC380V 电源的“渔用金属卤化物灯镇流器”,并以此获得我国“实用新型专利证书”<sup>[2]</sup>。因此,按国内线路研制可谓驾轻就熟。

## 1.2 研制概况

国内流行的镇流电路,被称为“超前顶峰式镇流器”。如图 1 所示,该镇流器由带槽隙的顶峰式自耦变压器和电容器组合而成<sup>[1]</sup>。电容器可选用现成产品,余下的问题就是要研制出与 5kW 金属卤化物灯相匹配的带槽隙的顶峰式自耦变压器(以下简称“该变压器”,亦即前文所指的“镇流器主体”)。

与通常意义的变压器不同,该变压器结构较特别,不仅在铁芯上开了槽隙(使磁回路中的磁阻增大),而且在原、副线圈间插入了磁分路片(使原、副线圈间互感减小)。这样的结构,使得该变压器的制作参数难以通过精确计算得到,因而科研人员采用“试样实测、逐步逼近”的方法来获取该变压器的制作参数。而试样的制备与修改,尤其是第一只试样制作参数的确定,很大程度源自经验。这正是研制该镇流器的一个关键点。

1999 年 11 月初,铁芯冲片设计图完成了。1999 年 12 月中旬,第一只试样出炉。以后,通过四轮的试样测试、修改和再制作,于 2000 年初确定了该变压器的制作参数。当年春,15 台试制镇流器进入了实船生产使用。以上是第一轮研制的。在第一轮研制中主要存在二个问题:一是由于初次设计,难免保守,铁芯冲片的尺寸偏大;二是工艺上的问题,部分镇流器噪声过大。2000 年底,在总结第一轮研制工作的基础上,开始了第二轮的研制,改小了冲片的尺寸,使结构更紧凑,并找到了降低噪声的工艺途径。2001 年春夏,20 台新定型的镇流器又被成功研制出来。

## 1.3 主要技术参数

输入电源:AC220V/50Hz;空载时输入电流:< 10A;启动时输入电流:< 15A;稳定后输入电流:24A;启动时输出电流:25A;稳定后输出电流:18A;额定输出功率:5kW;功率因数: $\geq 0.95$ 。

## 2 水下灯的指示报警电路的研制

水下灯的故障可分为三种:①镇流器无输出;②灯泡寿终正寝,但玻壳仍完好,形成“灯断路”;③灯具或灯线电缆被海水侵入导致短路。水下灯出了故障应及时排除,否则不仅浪费能源而且贻误“战机”,尤其是第三种情况还可能引起镇流器起火。但作业中的水下灯一般位于水下 100m~300m 的深处,船上的人根本无法用肉眼观察到

它的灯光。如何获知水下灯的状况呢?经研究,可以利用电表指示来进行判断。如图 2 所示,在金属卤化物灯回路中接入电压表 V 和电流表 A,就可以对照表 1 来判断水下灯的状况。

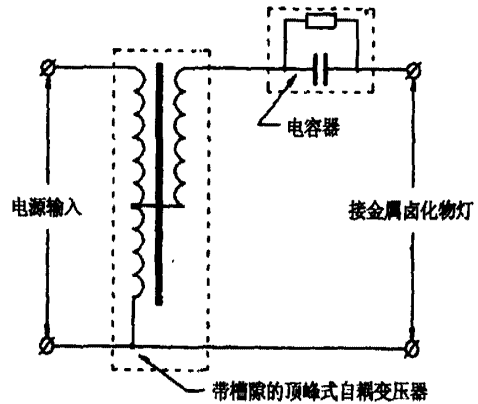


图 1 超前顶峰式镇流器电路

Fig.1 The stabilier circuitry of leading current & peak style

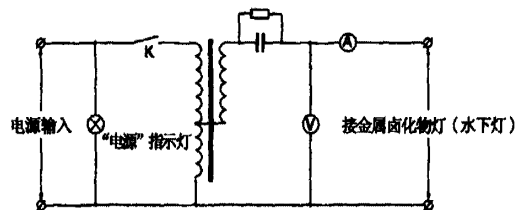


图 2 带有电表的镇流器电路

Fig.2 The stabilier circuitry with the ammeter

表 1 水下灯工况与电表指示的对应关系

Tab.1 The corresponding relation between the working condition of the underwater light and the indication of the ammeter

水下灯工况	电表指示情况
正常:启动	刚启动时, $V=0, A \approx 25(A)$ 。接着 $V$ 逐渐上升, $A$ 逐渐下降。
稳定后	$V \approx 290(V), A \approx 18(A)$
故障:镇流器无输出	$V=0, A=0$
灯断路	$V \approx 410(V), A=0$
短路	$V=0, A \approx 25(A)$

用电表指示虽然电路简单,但存在以下问题:

(1) 利用电表进行判断不够直观简易,需要一定的专业知识。这对于总体素质不够高的我国渔民来说,不能不说是个问题。

(2) “短路”是最严重的故障,但它与“启动”的初期极为相似。为了区别两者,必须有足够长的观察时间。另外,当灯正常点亮后,也有可能突发故障。为了及时处理故障(尤其是对“短路”),应有人员随时监视电表的指示情况并作出判断。

(3) 电表需占用较大面板面积,不利于镇流器总体体积的减小。

针对上述问题,科研人员运用微电子技术研制了镇流器指示报警电路。图3是其示意图。

不难看出,图3中的电压表V和电流表A分别被图4中的电压互感器和电流互感器所取代。监测功能逻辑电路根据对互感器的输出信号的处理,实现对水下灯工况的在线智能显示。指示灯采用Φ3.5高亮度LED,大大减小了面板占用面积。用绿灯表示正常,红灯表示故障,特别是对于“短路”这种最严重的故障,采取了光显示和声报警双重措施,警示信息使人能在第一时间作出最快捷的反应,其直观性、简易性和实时性是显而易见的。另外,利用“总电源”指示灯和“监测电路”工作指示灯以及“监测电路”工作指示灯和状态信息指示灯之间的互检,还能对指示报警部分的自身故障作出初步判断(限于篇幅,不予详述)。整个电路(包括自行研制的互感器在内的)成本不到100元,比用电表还低。这种设计,应该是一种首创。

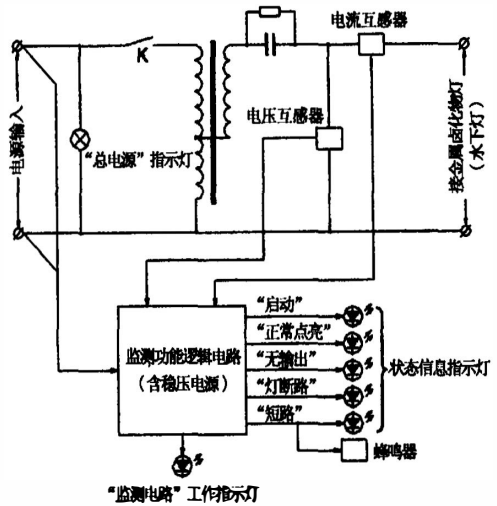


图3 带有指示报警电路的镇流器电路

Fig.3 The stabilier circuitry with the alarm circuitry

### 3 结束语

一年多来,科研人员不仅研制成功了与日产5kW金属卤化物灯相匹配的镇流器主体(见图4),而且还开发了相配套的指示报警监测电路。研制出来的产品,已小批量提供给实船生产使用,填补了国内的空白,受到了渔民的欢迎,取得了很好的效果,为鱿钓水下灯设备的国产化作出了积极的贡献。

水下集鱼灯系统主要包括灯泡(金属卤化物灯)、镇流器和卷扬机三大部分。除了5kW灯泡(金属卤化物灯)尚在研制和完善过程中,镇流器和卷扬机都已被研制成功。目前,国内鱿钓船可选用国产的镇流器和卷扬机再配上日产的5kW金属卤化物灯来装备水下集鱼灯系统。

与发达国家相比,我国在渔用设备先进性上还存在一定的差距,这正为科研工作者留下了广阔的用武之地。

### 参考文献:

[1] 周大明. 光源原理与设计[M]. 上海: 复旦大学出版社, 1993. 66 - 252.  
 [2] 倪谷来. 渔用金属卤化物灯镇流器的研制和应用[J]. 渔业现代化, 1998, 4: 26 - 28.

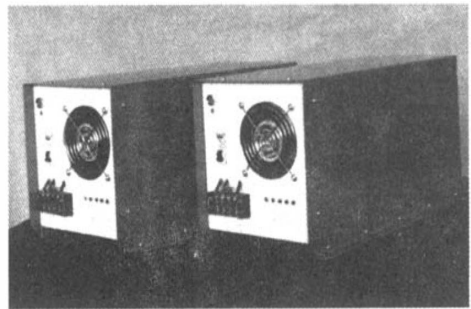


图4 研制成功的镇流器

Fig.4 The stabilier which has been developed successfully

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